

14. The gas diffusion electrode as claimed in claim 12, wherein the carbonaceous material comprises a fibrous carbonaceous material.

15. The gas diffusion electrode as claimed in claim 14, wherein the fibrous carbonaceous material is selected from the group consisting of carbon nanotubes, graphite fibrous materials, vapor-grown carbon fibers and mixtures thereof.

16. The gas diffusion electrode as claimed in claim 12, wherein the gas diffusion electrode comprises a catalyst having a metal component which is applied to at least a portion of the surface of the carbonaceous material.

17. The gas diffusion electrode as claimed in claim 16, wherein the metal component is selected from the group consisting of platinum, platinum alloys and combinations thereof.

18. The gas diffusion electrode as claimed in claim 12, wherein the carbon-based material of the proton conductor material is selected from the group consisting of carbon clusters, carbon nanotubes, fullerenes and mixtures thereof.

19. A fuel cell comprising:

a first electrode, a second electrode and a proton conductor layer disposed between the first electrode and the second electrode, wherein at least one of the first electrode and the second electrode comprises a carbonaceous material having a surface and a proton conductor material that is applied to at least a portion of the surface.

20. The fuel cell as claimed in claim 19, wherein the proton conductor material comprises a material that is substantially composed of a carbon-based material forming a matrix structure and at least one type of a proton dissociative group attached to the matrix structure.

21. The fuel cell as claimed in claim 19, wherein the carbonaceous material comprises a fibrous carbonaceous material.

22. The fuel cell as claimed in claim 21, wherein the fibrous carbonaceous material is selected from the group consisting of carbon nanotubes, graphite fibrous materials, vapor-grown carbon fibers and mixtures thereof.

23. The fuel cell as claimed in claim 19, wherein at least one of the first electrode and the second electrode comprises a catalyst having a metal component that is applied to at least a portion of the surface of the carbonaceous material.

24. The fuel cell as claimed in claim 23, wherein the metal component is selected from the group consisting of platinum, platinum alloys and combinations thereof.

25. The fuel cell as claimed in claim 19, wherein the carbon-based material of the proton conductor material is selected from the group consisting of carbon clusters, carbon nanotubes, fullerenes and mixtures thereof.

26. The fuel cell as claimed in claim 25, wherein the proton conductor layer comprises a material similar to the proton conductor material.

27. The fuel cell as claimed in claim 19, wherein the first electrode comprises a fuel electrode and the second electrode comprises an oxygen electrode.

28. A fuel cell comprising:

a first electrode, a second electrode and a proton conductor layer disposed between the first electrode and the second electrode, wherein the first electrode and the second electrode each comprise a fibrous carbonaceous material and a proton conductor material that is applied to at least a portion of the fibrous carbonaceous material.

29. The fuel cell as claimed in claim 28, wherein the fibrous carbonaceous material is selected from the group consisting of at least one type of a carbon nanotube, a graphite fibrous material, a vapor-grown carbon fiber and mixtures thereof.

30. The fuel cell as claimed in claim 28, wherein the first electrode and the second electrode each comprise a catalyst having a metal component that is applied to at least a portion of the fibrous carbonaceous material.

31. The fuel cell as claimed in claim 30, wherein the metal component is selected from the group consisting of platinum, platinum alloys and combinations thereof.

32. The fuel cell as claimed in claim 28, wherein the proton conductor material comprises a material that is substantially composed of carbon forming a matrix structure and at least one type of a proton dissociative group attached to the matrix structure.

33. The fuel cell as claimed in claim 32, wherein the proton conductor material is selected from the group consisting of at least one type of a carbon cluster, at least one type of a fullerene including a fullerene in a sulfonated form, at least one type of a carbon nanotube including a carbon nanotube in a sulfonated form and mixtures thereof.

34. The fuel cell as claimed in claim 32, wherein the proton conductor layer comprises a material similar to the proton conductor material.

35. The fuel cell as claimed in claim 28, wherein the first electrode comprises a fuel electrode and the second electrode comprises an oxygen electrode.

36. A method of producing a fuel cell, the method comprising the steps of:  
providing a first electrode, a second electrode, and a proton conductor layer disposed between the first electrode and the second electrode;  
providing a carbonaceous material;  
mixing the carbonaceous material having a surface with a solvent comprising a proton conductor material;  
coating the surface of the carbonaceous material with the proton conductor material; and

forming at least one of the first electrode and the second electrode with the carbonaceous material.

37. The method as claimed in claim 36, wherein the proton conductor material comprises a material substantially composed of carbon-based material that forms a matrix structure and at least one type of a proton dissociative group that is attached to the matrix structure.

38. The method as claimed in claim 37, wherein the carbon-based material is selected from the group consisting of carbon clusters, fullerenes, fullerenes in a sulfonated form, carbon nanotubes including carbon nanotubes in a sulfonated form and mixtures thereof.

39. The method as claimed in claim 36, wherein the carbonaceous material comprises a carbonaceous material composed of carbon fibers.

40. The method as claimed in claim 39, wherein the carbonaceous material is selected from the group consisting of at least one type of a carbon nanotube, a graphite fibrous material including a vapor-grown carbon fiber and mixtures thereof.

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